

Writing the Technical Report*

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Two sentences from a previous paper³ might be used as the introduction to this paper:

"The catch phrase, 'Engineers (or scientists) can't write,' has gone unchallenged too long.... Management has gradually come to realize that, far from being a waste of time, for the research man to write the first report of his work is vital to the quality of his research."

Good writing is valuable to an organization because time and money may be saved when research results can be put to immediate use because information was presented accurately, briefly, and comprehensively in a good research report. A good report of even negative results may be useful in many ways: it may prevent another from following the same fruitless program, it may suggest the correct solution to a problem since the expected solution was incorrect, and it may indicate other applications of the results.

This paper is addressed primarily to the technical editors, research supervisors, and others (for convenience, hereafter called *reviewers*) concerned with expediting the writing of good reports by research men (authors).

A good technical report is primarily dependent upon good science. There is some technical worth to even the most poorly written report of basically good research. No matter how confusing the writing may be, a careful reader may gain some worthwhile information from the data. But it is too much to expect even the most skillful writing to salvage research that was poorly planned and poorly executed. So a research supervisor may find that a research man cannot write a good report because he has not done good research.

This is seldom true, however, and a reviewer must be especially careful not to make unwarranted sweeping statements such as "All wrong!" when he merely means that he would write the report more elegantly or that the grammar is poor. This paper deals with evaluation of writing, not of technical contents of a report.

If research men cannot write good technical reports, they must be taught. However, like most generalities, "Engineers and scientists can't write," is basically untrue. Most engineers and scientists can write if they are given a maximum of encouragement and a minimum of interference.

The basic problem in developing good report writing is one of recognizing a good technical report; it is one which presents information

Accurately
Briefly
Comprehensively.

There is no one correct style for writing a good technical report. The same material may be presented equally effectively in more than one way. Of course, it is possible for an organization to require that all reports be written to one pattern, but such a practice usually produces only frustrated authors and overworked reviewers. It seldom produces better reports.

Any reviewer who finds himself rewriting, instead of editing, most of the reports he receives is certainly not teaching authors to write. Rewriting is faster than encouraging and helping an author to revise his own report, but this practice, too, produces frustrated authors, not better ones. Any reviewer who carefully goes through reports "putting the punch line at the end of the sentence" or "eliminating any *ly* adverb at the beginning of a sentence" should ask himself whether he is trying to improve the writing or to exercise his vanity.

A good technical report may be as interesting to read as a good detective story (w-e-l-l -- almost--to another research man), but it need not be deliberately written to be. A research report has a captive audience, so the author does not need to spend time and effort trying to write a report that will attract and hold readers. True, an author should be encouraged to write as interestingly as he can, but he should be required only to produce an accurate, precise report written in a manner that is easy to understand and that does not lead to misunderstanding.

Writing technical reports is like any other skill—it is perfected through practice. The way to learn to write good technical reports is to write and to keep on writing. But perfection is not gained through practicing poor habits—an author must profit from his mistakes as well as from the advice and examples of others. His first report may be a poor thing requiring much rewriting (on his part) and editing, but that first attempt is a necessary step in the process of learning to write. An author's fifth or sixth report should be such an improvement over his first that it requires far less effort of him and of others. If no improvement is evident, something is wrong. Most research men want to learn to write good reports and will try to do so. They realize that a research

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worker establishes his competency by communicating his results to his colleagues and to his supervisors. Even end-item research is dependent upon good reports because poor interim reports may result in termination of a project before an end item can be produced.

There may be antagonism between the reviewer and the author; any quasi-educational situation involving two adults outside of a classroom is certain to be sensitive. There must be mutual respect and understanding between the two. The author must believe that the reviewer is competent and reasonable, and the reviewer must believe that the author has something worth writing about and that he wants to learn. It is especially important that the reviewer appreciates an author's need for pride in his work.⁵

The criteria for good reports may be so unrealistic or so indefinite that the author cannot meet the demands placed upon his reports. A good style manual is one of the most valuable tools that can be given to any report writer—novice or experienced. A manual should never be used as a club to keep authors in line; it should be offered as a guide to help them to collect and organize material. Although any style manual is a compendium of many arbitrary decisions, an author should be willing to accept his organization's established style and format because a manual relieves him of the need for making many routine decisions.

If an organization does not have its own style manual, a reviewer may help a new author by giving him copies of previously accepted reports or an acceptable style manual from another organization. Anyone wishing to compile a style manual will, of course, start by collecting manuals from as many organizations similar to his own, as possible. Most organizations are quite generous in allowing portions of their manuals to be copied when proper credit is given.²

Often an author has trouble writing reports because one report is expected to be technical enough to inform his colleagues and supervisors of his progress and yet simple enough to be read and used by nontechnical people such as the advertising department and the comptroller's office. With such requirements a routine technical report may be more difficult to write than a special report or paper given in a technical division of a national meeting because such a paper is intended for only one type of audience, other scientists somewhat familiar with the vocabulary and problems of the research. A possible solution to the multi-audience report is to consider it a tripart report for three types of audiences.

The *summary* or *abstract* may be written in general terms, as the least technical part of the report, to provide sufficient information for administrative personnel to make policy and fiscal decisions. It will also be used for library indexing of the report.

The *body of the report* may be written in more technical terms, designed to inform other scientists, not necessarily specialists in the particular research field. It may be a comprehensive survey of the research project with references to specific technical details which are given in the appendix(es).

The *appendix(es)* may be the most technical part of the report written to inform other specialists who will evaluate the work done or use it to further their own research. This type of appendix may contain specific, detailed technical

material like theoretical analyses, mathematical calculations, and analytical or testing procedures. Sometimes only summary tables and graphs are given in the body of a report and the supporting data are given in appendixes. Of course, such incidental information as manufacturers of chemicals and equipment used may also be placed in the appendix(es).

Standards should not be set too high for a beginning author to attain. In time he may learn to write like a C. P. Snow or a Leo Szilard, but a reviewer must be willing to settle for less. It is more important that a beginner be encouraged to develop a precise vocabulary rather than an extensive one.

A precise, basic vocabulary will contain some long technical words used because they are needed to express exact technical concepts. Therefore, a good technical report will not do well by Flesch's Easy Reading and Gunning's Fog Index tests. However, the reviewer must help the author distinguish between the use of technical words used for precision and technical words used for ostentation. Above all, he will have to discourage the coining of a word to express a technical concept for which there is already an accepted word. There is a narrow line between jargon and acceptable technical language.

Much confusion may be caused when an author is told "lend variety and interest to your writing by using synonyms." As Dr. B. Willder, president of Solecisms Unlimited (a creation of Robert L. Dean, Editor of Smith, Kline and French's "Psychiatric Reporter") says in describing Silly Synonyms, one of his company's best sellers, "... most people will do anything to avoid using the same word twice in the same sentence, the same paragraph, or some other arbitrary unit. So our laboratories supply them with another word that means *almost* the same thing. Our goal, of course, is to weaken the sentence—to rob it of emphasis, to ruin its rhythm, maybe make it completely confusing." Although Solecisms Unlimited is "perhaps the country's foremost producer of the jargon, clichés, dead verbs, numb nouns, and addled adjectives used so widely in chemical and engineering writing," Dr. B. Willder says, "... We sell a Silly Synonym any time any kind of writer prefers elegant variation to clarity."

Many organizations offer on-the-job-training courses in report writing or encourage their research men to take such courses at nearby schools. Some organizations report that they have had best results from courses taught by technically trained personnel; others report equally good results from courses taught by English teachers and other nontechnical people. Any organization offering a good report writing course will usually find more men wanting to take the course than can be taught in one class. The usual course meets once a week (a 2-hr. session) for 15 to 18 weeks. Some organizations have no regular courses, but occasionally invite outside speakers to conduct seminars on specific topics like designing tables of data or writing abstracts. Many schools and communications consulting firms are offering intensive 1-week courses in report writing, especially in the summer.

A college course in general composition may be helpful when no specific course in technical writing is available. The same basic rules of grammar, sentence and paragraph structure, and spelling apply to technical writing as apply

to other expository writing. When possible such a general course should be supplemented by some instruction in problems peculiar to technical report writing: tabulation, designing graphs, etc.

Although the basic fault of most poor technical reports is poor grammar, there seems to be a gentleman's agreement not to mention grammar in technical report writing to working scientists. A common source of confusion is the use of a singular subject with a plural verb, or *vice versa*, yet agreement of subject and verb is among the first rules of grammar taught in grade school. Another common error is failure to make each declarative sentence complete with subject and verb. Dangling participles and pronouns with no clear antecedents also contribute confusion to technical reports. Careful editing should make an author aware of his grammatical errors, and tactful discussion should encourage him to "brush up" on his grammar. There is good precedent for a chemist to concern himself with grammar—the first English grammar was compiled by Joseph Priestley.

Many grammatical errors could be avoided by encouraging beginners to write reports in uniformly short, simple sentences. Although they might not be particularly interesting to read, they certainly should be easy to read. Just as a baby learns to creep before it learns to walk and to walk before it learns to run, an author should be encouraged to write simple but accurate and comprehensive reports. Then, as he develops skill and a more fluent style with each successive report that he writes, he may try to develop a more elegant style with more complex sentences, if that seems desirable.

The reviewer who makes a carefully selected collection of books available to authors, will be surprised at how often a man will take the opportunity to look up information on some particular aspect of his writing—even grammar. Rowena Ferguson's list⁴ for the "Editor's Bookshelf" is a good source for selecting books on such general topics as grammar, editing, printing, and illustrating. The bibliographies in such texts on technical editing and writing as those by Weil⁷ and Ulman⁶ are good sources for lists of more specialized books.

Some authors may balk at reading books or even selected portions in a book but will readily accept reprints

of short journal articles or condensations of material read by a reviewer or prepared by him from his own experiences and observations of technical writing. Sometimes all that is needed is such a simple device as suggesting "Ten Steps to Easier Writing"¹.

1. Write and revise a bit at a time.
2. Assemble all source materials—including literature search cards—before writing complete draft.
3. Set up tables and graphs.
4. Write out conclusions.
5. Write an annotated outline.
6. Start writing without worrying about grammar or spelling.
7. After 12 hr. edit or rewrite the first draft.
8. Write abstract or summary last.
9. Have revised and retyped draft reviewed by a colleague.
10. Again revise and have final copy typed.

Writing a technical report never becomes an easy task but it can be made less arduous by practice by the author, encouragement and consideration from the reviewer, and cooperation among author, reviewer, and clerical staff.

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